BELLCOMM, INC.
955 L'ENFANT PLAZA NORTH, S.W. WASHINGTON, D. C. 20024

B71 02009

SUBJECT: KSC Voice Communications Monitoring During Apollo 14 CDDT - Case 320

DATE: February 3, 1971

FROM: L. A. Ferrara

ABSTRACT

Voice communications at KSC were monitored during the Apollo 14 Countdown Demonstration Test. No anomalies were noted in the communications interfacing with the spacecraft. The Operational Intercomm System adequately supported the test, although there were some hardware failures in the OIS end instruments which caused periods of noise and crosstalk on some channels. These problems were isolated by communications personnel as the CDDT progressed and did not delay the Test.

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MEMORANDUM FOR FILE

1.0 INTRODUCTION

Selected voice communications channels were monitored at KSC during the latter parts of the Apollo 14 Countdown Demonstration Test (CDDT) on January 17-19, 1971. The Operations Intercomm System (OIS-RF) and the interfacing facilities adequately supported the Test although there were some equipment and operational problems which are detailed in the following section. As a general note, the OIS-RF performance seemed to be somewhat degraded during the WET CDDT with respect to channel noise and occasional squelch breaking relative to the performance during the DRY CDDT on the following day and the author's recollection of the general performance of the OIS during the Apollo 14 Flight Readiness Test. This observed degradation may be due in part to the large number of users on the circuits particularly during the terminal count of the WET CDDT.

During DRY CDDT, a severe crosstalk problem was disturbing because it coupled Channel 111 into Channel 214, two important operational communication paths. The source of the crosstalk was subsequently found to be defective unattended end instrument. It was noted that several different circuit configurations were used during the test, possibly voiding the benefits of using carefully pretested channels. One such configuration change involved a Long Lines/OIS channel interface problem.

2.0 DETAILED OBSERVATIONS

The following Bellcomm/MAS personnel monitored from the positions indicated:

J. J. Hibbert - Audio-Visual Theater (CD&SC)

J. T. Raleigh - NR Communications Lab (MSOB)

L. A. Ferrara - Communications Console (LCC-39 FR#1)

TIME (EST)	OBSERVATIONS
Sun. 1/17/71 20:28	[T-9:30 Back-up Crew Comm checks - WET CDDT] Occasional low level squelch breaks heard on Channel 111.
20:34	In preparation for the Back-up Crew Comm checks, the spacecraft switchlist checkout was conducted by MTPE on Channel 212, the spacecraft test conductor (MSTC) channel, instead of the assigned Channel 222.
21:01	The initial request for permission to make the abort loop verification checks on Channel 212 was denied because the channel was being used for spacecraft checkout.
21:30	MSTC was advised of monitor only circuit capability on Channel 214 to MCC (such as documented in the Long Lines Communication Guide - A/G Annex).
21:40	Both back-up crewmen (SCDR/SLMP) sounded very "tinny" (low frequency components attenuated) when they reported on Channel 212 after donning the ASTRO headsets. Background acoustical noise level in the spacecraft was moderate to loud.
21:57	Back-up communication checks with HFLT completed, apparently satisfactory in all modes. No spacecraft volume thumbwheels had to be changed to obtain good communications with HFLT. HFLT reported all voice communications satisfactory except the signal level variation on VHF downlink when the MSS was in motion.
22:00	HFLF requested MSTC to meet him on Channel 214, apparently unaware that he had a monitor only circuit configuration. Communication was established apparently through the simultaneous use of Channels 212 and 214.
Mon. 1/18/71 14:33	Audible chirps observed on Channel 111.
15:10	OIS Channel 151 who reported crosstalking into Channel 121 and others. Trouble shooting procedure initiated to isolate source of crosstalk.

15:52 OIS crosstalk and noise problem believed isolated to end unit in Room 25E15A of VAB. Unit was found with volume controls full open and no terminating headset. Subsequent investigation of the unit showed no functional problem, but it could be made to repeat the trouble.

16:03 CDDT (Wet) count resumed at T-3:40

16:05 Noise and occasional squelch breaks were observed on Channels 111 and 151 on both audio and RF side of modem. The noise was generally attributed to high traffic rate on channels as the test proceeded to completion.

Tues. 1/18/71 Back-up Crew Comm Checks DRY CDDT.

08:30 Sampling of various OIS-RF channels indicate considerably less background noise on the channels.

08:50 VHF downlink communications from the spacecraft reported as "unbelievably clear" during the B/V VHF transceiver test.

08:53 LMP reported that HFLT was weak (low signal level) during the down voice back-up test.

08:57 BCMP in CMP position had to increase his S-Band volume thumbwheel setting to 6.0 (it was reported as having not been previously adjusted). The crewmen in the spacecraft sounded much clearer than during the same test sequence of the Wet CDDT, possibly due to the lower background noise level on the OIS channels and/or spacecraft.

09:00 Two way voice checks with HFLT on Channel 214 reported satisfactory.

09:03 CSM turnaround of ranging signal reported during the down voice back-up test. GMIL reported they may not have been in the proper mode and mode 6.16.0 may not be the best configuration for this check. A new list of S-Band configuration modes are reportedly due out for Apollo 15.

It was noted that MTPE used a different communications channel configuration (222 versus 212) during this back-up crew communication check than during the similar checks of the WET CDDT, and still slightly different in the terminal count.

09:20	Back-up crew communication checks satisfactorily completed. Communications channels observed from Console AD-17 in FR#1 were generally of good quality and level.
09:23	T-6 Hours and counting.
09:51	Houston Flight was observed to be of very even level when he transmitted on Channels 111 and 212.
09:59	Poor return loss was experienced on OIS Channel 214 Long Lines circuit to Houston. Communications personnel exercised the contacts in the 304 conferencing switch and substituted trunk circuits in the CD&SC until the return loss was within Specification (-31dB @ +5 TLP).
10:08	Voice check with Houston on Channel 214 was satisfactory.
11:26	"Hard Top 1" rescue vehicle communication check on Channel 111 was distorted but readable over their VHF link.
11:57	MSTC notified HFLT that he now had two way communication on Channel 214.
12:26	GMIL reported the S-Band antenna drive inoperative. The problem was quickly traced to a loose electronic module and corrected. While this type of failure would not effect CDDT, it could have significant consequences during launch.
12:41	LMP voice sounded distorted when he first checked in on Channel 212.
12:49	Noise burst observed on Channel 111 reportedly caused by power transfer on crawler transporter.
12:54	GMIL reported LMP sounded garbled on VHF. MOLC reported voice sounded normal.
12:58	Comm voice checks between HFLT and prime crew reported loud and clear both ways.
13:05	Aeromedical hardline voice circuit reported inoperative.

13:25 Crosstalk from some unknown station appearing on Channel 214.

13:33 HFLT was low level on Channel 214 advised to speak up.

13:40 Channel 111 crosstalking into Channel 214. Communications personnel dispatched to PAD area where source of trouble indicated.

13:42 Noise level becoming high on Channel 222/223.

13:48 Voice communications lost with CDR on Channel 223. Problem caused by inadvertent switch action at Stoney Panel.

13:52 Channel 222/223 became very noisy. Operational traffic moved to Channel 225. Noise was isolated to High Bay 2 area, but the source was not found. RFI is suspected.

14:17 Difficulty reported in isolating crosstalk problem because of high traffic density on Channels 111 and 214.

15:07 It was noted that GMIL did not drop constant key VHF during the Houston Comm checks.

15:08 There apparently was a channel configuration problem on the Stoney panel at the T-15^{m} ASTRO Launch communication check where CSTO was initially transmitting on Channel 214. After reconfiguring the panel all stations (LOM, CSTO, MSTC and spacecraft) reported loud and clear voice communications. The CD&SC observer reported the ASTRO Launch circuit was of excellent quality.

It may be appropriate to specify in the test procedure on which Channel CSTO should communicate with MSTC without interfering with the Communications links to the spacecraft.

15:22 An unattended OIS-RF end instrument in a Systems Safety Trailer was found set up with Channel 214 active/Channel 111 monitor. All four volume controls were wide open. This unit was identified as the cause of the high level crosstalk between Channels 111 and 214. Preliminary examination of the unit revealed an audio amplifier card with an abnormally high gain and it was possible to reproduce the crosstalk problem. Investigation is still progressing.

15:23 Simulated Lift off

15:42 During an ad hoc review of the communications problems after the simulated liftoff, GMIL reported to MCSE that the OIS had less than desirable performance particularly since some of the circuit noise had been transmitted to the spacecraft. Differences in amplifier gains between the umbilical and VHF circuits to the spacecraft were also noted.

15:54 The Pad Leader commented on the excessive noise on the OIS channels and that MSTC had sounded "hollow" during several transmissions. Subsequent voice communications checks between MSTC and SPAD could not cause the problem to repeat.

It is believed some of the OIS channel noise problems can be related to the OIS/UHF radio link interface to the crawler transporter (which is in motion back to the pad during the terminal count). This is not a normal launch day terminal count configuration and may be unnecessarily penalizing the communication facilities.

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